

An object-oriented virtual machine interface for a reconfigurable wireless
 network communication apparatus;

said reconfigurable wireless network communication apparatus comprising a plurality of kernels; and

said object-oriented virtual machine interface comprising a plurality of software objects including a first subset of said software objects, each software object in said first subset of said software objects associated with a different kernel in said plurality of kernels so that a change to a software object in said first subset of said software objects results in a change in said kernel associated with said software object.

- The object-oriented virtual machine interface of claim 1 wherein said plurality
   of software objects includes a second subset of said software objects, each software object in said second subset of said software objects having at least one adjustable attribute.
- 3. The object-oriented virtual machine interface of claim 2 wherein said as least one adjustable attribute is a static or dynamic attribute.
  - 4. The object-oriented virtual machine interface of claim 1 wherein a kernel in said plurality of kernels is configurable in accordance with a communication protocol.
- 25 5. The object-oriented virtual machine interface of claim 4 wherein said selected communication protocol is a CDMA (code division multiple access) protocol.
- The object-oriented virtual machine interface of claim 4 wherein said communication protocol is selected from the group consisting of IS-95 CDMA,
   IS-95B CDMA, CDMA TIA IS2000, TIA IS 2000A, wideband CDMA (WCDMA), cdma2000, and ARIB WCDMA.

9824-0062-999 44 CA1 - 263522.5

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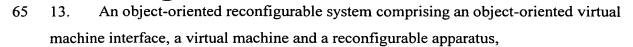
- 7. The object-oriented virtual machine interface of claim 4 wherein said selected communication protocol is a time division multiple access (TDMA) protocol.
- 8. The object-oriented virtual machine interface of claim 7 wherein said communication protocol is IS-136 TDMA.
- 9. The object-oriented virtual machine interface of claim 1 wherein a software
  40 object in said plurality of software objects is a searcher object, a code generation unit object or a finger object.
- 10. The object-oriented virtual machine interface of claim 1 wherein a software object in said plurality of software objects is a matched filter object or a combiner45 object.
  - 11. The object-oriented virtual machine interface of claim 1 wherein a software object in said plurality of software objects is an uplink object or a downlink object.
- 50 12. The object-oriented virtual machine interface of claim 1, said plurality of software objects comprising a searcher object, a code generation unit object, a finger object, a matched filter object, a combiner object, an uplink object and a downlink object; and

said plurality of kernels comprising a searcher kernel, a code generation unit kernel, a finger kernel, a matched filter kernel, a combiner kernel, an uplink kernel and a downlink kernel; wherein:

> said searcher object is associated with said searcher kernel; said code generation unit object is associated with said code generation unit kernel;

said finger object is associated with said finger kernel;
said matched filter object is associated with said matched filter kernel;
said combiner object is associated with said combiner kernel;
said uplink object is associated with said uplink kernel; and
and said downlink object is associated with said downlink kernel.

9824-0062-999 45 CAL-263522.5



said reconfigurable apparatus coupled to said virtual machine and comprising a plurality of kernels; and

said object-oriented virtual machine interface coupled to said virtual machine and comprising a plurality of software objects including a first subset of said software objects, each software object in said first subset of said software objects associated with a different kernel in said plurality of kernels such that a change to a software object in said first subset of said software objects results in a change in said kernel associated with said software object.

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14. The object-oriented reconfigurable system of claim 13 wherein said plurality of software objects includes a second subset of said software objects, each software object in said second subset of said software objects having at least one adjustable attribute.

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15. The object-oriented reconfigurable system of claim 14 wherein said at least one adjustable attribute is a static or dynamic attribute.

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16. The object-oriented reconfigurable system of claim 13 further comprising: an application program interface comprising a plurality of software routines, each software routine in said plurality of software routines representing a different communication protocol, wherein said plurality of software routines comprise software calls to said plurality of software objects; and

an application program comprising software calls to said plurality of software routines.

17. The object-oriented reconfigurable system of claim 16 further comprising: a compiler within said virtual machine to translate said application program into machine-readable instructions executable on said object-oriented reconfigurable system.

9824-0062-999 46 CA1-263522.5

- 18. The object-oriented reconfigurable system of claim 17 further comprising:

  a resource allocator within said object-oriented reconfigurable system, said

  5 resource allocator configured to receive said machine-readable instructions and issue a signal to configure a kernel in said plurality of kernels.
  - 19. The object-oriented reconfigurable system of claim 13 further comprising: an application program for utilizing said plurality of software objects.

20. The object-oriented reconfigurable system of claim 19 further comprising: a compiler within said virtual machine to translate said application program into machine-readable instructions executable on said object-oriented reconfigurable system.

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- 21. The object-oriented reconfigurable system of claim 20 further comprising: a resource allocator configured to receive said machine-readable instructions, and issue a command signal to control a kernel in said plurality of kernels.
- 20 22. The object-oriented reconfigurable system of claim 13 wherein a software object in said plurality of software objects is a searcher object, a code generation unit object a finger object, an uplink object or a downlink object.
  - 23. The object-oriented reconfigurable system of claim 13,
- said plurality of software objects in said first subset of said software objects comprising a searcher object, a code generation unit object, a finger object, a matched filter object, a combiner object, an uplink object and a downlink object; and

said plurality of kernels comprising a searcher kernel, a code generation unit kernel, a finger kernel, a matched filter kernel, a combiner kernel, an uplink kernel and a downlink kernel; wherein:

said searcher object is associated with said searcher kernel; said code generation unit object is associated with said code generation unit kernel;

said finger object is associated with said finger kernel;

9824-0062-999 47 CA1-263522.5

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said matched filter object is associated with said matched filter kernel; said combiner object is associated with said combiner kernel; said uplink object is associated with said uplink kernel; and and said downlink object is associated with said downlink kernel.

- 24. The object-oriented reconfigurable system of claim 13 wherein said plurality of kernels comprise a searcher kernel, a code generation unit kernel, a finger kernel, an uplink kernel and a downlink kernel.
  - 25. The object-oriented reconfigurable system of claim 13 wherein a kernel in said plurality of kernels is configured to operate under a CDMA protocol.
- 15 26. The object-oriented reconfigurable system of claim 25 wherein said CDMA protocol is selected from the group consisting of IS-95 CDMA, IS-95B CDMA, CDMA TIA IS2000, TIA IS 2000A, wideband CDMA (WCDMA), cdma2000, and ARIB WCDMA.
- 20 27. The object-oriented reconfigurable system of claim 13 wherein a kernel in said plurality of kernels is configured to operate under a TDMA protocol.
  - 28. The object-oriented reconfigurable system of claim 27 wherein said TDMA protocol is IS-136 TDMA.
  - 29. A method of communication using an object oriented virtual machine interface and a reconfigurable multi-protocol communication apparatus, said reconfigurable multi-protocol communication apparatus including a plurality of kernels and an interconnect structure for interconnecting said plurality of kernels, said method comprising:

creating a plurality of software objects, each software object in said plurality of software objects corresponding to a different kernel in said plurality of kernels;

assigning an attribute value to a software object in said plurality of software objects in accordance with a communication protocol; and

9824-0062-999 48 CA1-263522.5

configuring the kernel associated with said software object in accordance with said attribute value.

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- 30. The method of claim 29 wherein at least two software objects in said plurality of software objects have a hierarchical relationship.
- 31. The method of claim 29 further comprising developing an application programthat includes software calls to said plurality of software objects.
  - 32. The method of claim 31 further comprising developing a software virtual machine to process said application program.
- 15 33. The method of claim 32 further comprising translating said application program into a program executable on said software virtual machine.
  - 34. The method of claim 33 further comprising issuing, from said software virtual machine, an instruction for controlling a kernel in said plurality of kernels.

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35. The method of claim 29 further comprising:

forming an application program interface comprising a plurality of software routines, said plurality of software routines representing a plurality of communication protocols, wherein said plurality of software routines comprise software calls to said

- 25 plurality of software objects.
  - 36. The method of claim 29 further comprising developing an application program comprising software calls to said plurality of software routines.
- 37. A computer program product for a reconfigurable object-oriented apparatus comprising a plurality of kernels and an interconnect structure for interconnecting said plurality of kernels, the computer program product comprising a computer readable storage medium and a computer program mechanism embedded therein, the computer program mechanism comprising:

9824-0062-999 49 CA1 - 263522.5

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instructions for instantiating a plurality of software objects, each software object in said plurality of software objects corresponding to a different kernel in said plurality of kernels such that a change to said software object results in a change in a state of said corresponding different kernel;

instructions for assigning an attribute value to a first software object in said plurality of objects according to a communication protocol; and

issuing machine-readable instructions to configure the kernel associated with said first software object in accordance with said attribute value.

38. The computer program product of claim 37, wherein the computer program mechanism further comprising instructions for:

instantiating a plurality of software routines from an application program interface, said plurality of software routines representing a plurality of standards, wherein said plurality of software routines comprise software calls to said plurality of software objects.

- 39. The computer program product of claim 37 wherein said plurality of software objects comprise:
  - a searcher object;
  - a code generation unit object;
  - a finger object;
  - an uplink object; and
- 25 a downlink object.
  - 40. The computer program product of claim 39 wherein said plurality of kernels comprise:
- a searcher kernel, a code generation unit kernel, a finger kernel, an uplink
  kernel and a downlink kernel respectively corresponding to said searcher object, said
  code generation unit object, said finger object, said uplink object and said downlink
  object, respectively.

9824-0062-999 50 CA1-263522.5

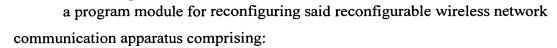
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- 41. A computer program product of claim 39 wherein said communication protocol is CDMA.
- 42. An apparatus to facilitate wireless communication, comprising a hardware reconfigurable and software programmable processor responsive to a predetermined virtual machine interface.
- 10 43. A method for reconfiguring a wireless network communication apparatus; said reconfigurable wireless network communication apparatus comprising a plurality of kernels;

the method comprising:

- parsing an application program that designates a communication protocol; and producing machine readable data capable of reconfiguring said reconfigurable wireless network communication apparatus in accordance with said communication protocol.
- 44. The method of claim 43 wherein an object-oriented virtual machine interface comprises a plurality of software objects, each software object in said plurality of software objects associated with a different kernel in said plurality of kernels so that a change to a software object in said plurality of software objects results in a change in said kernel associated with said software object;
- said machine readable data including a first software object selected from said plurality of software objects.
  - 45. The method of claim 44 wherein said first software object is a function or procedure.
- 30 46. A computer program product for use in conjunction with a reconfigurable wireless network communication apparatus, said reconfigurable apparatus comprising a plurality of kernels, the computer program product comprising a computer readable storage medium and a computer program mechanism embedded therein, the computer program mechanism comprising:

9824-0062-999 51 CA1 - 263522.5



instructions for parsing an application program that designates a communication protocol; and

instructions for producing machine readable data capable of reconfiguring said reconfigurable network communication apparatus in accordance with said communication protocol.

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47. The computer program product of claim 46, further including:

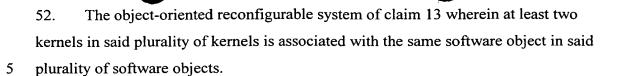
an object-oriented virtual machine module comprising a plurality of software objects, each software object in said plurality of software objects associated with a different kernel in said plurality of kernels so that a change to a software object in said plurality of software objects results in a change in said kernel associated with said software object; wherein

said machine readable data include a first software object selected from said plurality of software objects.

- 20 48. The computer program product of claim 47 wherein said first software object is a function or procedure.
  - 49. The method of claim 1 wherein a software object in said plurality of software objects is associated with at least two kernels in said plurality of kernels.

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- 50. The method of claim 1 wherein at least two kernels in said plurality of kernels is associated with the same software object in said plurality of software objects.
- 51. The object-oriented reconfigurable system of claim 13 wherein a software object in said plurality of software objects is associated with at least two kernels in said plurality of kernels.



9824-0062-999 53 CA1-263522.5